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(54) APPARATUS FOR THE LONGITUDINAL CUTTING OF PAPER WEBS FOR THE FOLDING APPARATUS OF A ROTARY PRINTING MACHINE

(71) We, MASCHINENFABRIK AUGSBURG - NÜRNBERG AKTIENGESELLSCHAFT, a German Company of 8900 Augsburg, Stadtbachstrasse 1, Germany, do hereby

declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an apparatus for the longitudinal cutting of one or more printed paper webs into strips of identical width for bringing together by way of one or more formers into a folding apparatus of a rotary printing machine.

According to this invention there is provided an apparatus for the longitudinal cutting of a printed paper web, or a plurality of such webs disposed in alignment one above the other, into strips of the same width, said apparatus including, for the or each web, an auxiliary cutting device for cutting the particular web into two strips, turning bars for bringing one of the two strips on to the other of the two strips, in the or each case, for another cutting operation in which one or both of the strips are cut in such manner that the strips become or remain of the same width, and the apparatus further including a device for effecting said another cutting operation and at least one former for bringing the strips of the same width together to present them to a folding apparatus of a rotary printing machine, said former being displaceable transversely to the direction of web movement to accommodate different strip widths and the device for effecting said another cutting operation being disposed upstream of the former and comprising a cutting roller defining a plurality of peripheral cutting grooves, and a counter-knife, the cutting roller being disposed with its axis at right angles to the direction of web movement and being axially displaceable independently of the former, the counter-knife also being mounted displaceably whereby it can be set to cooperate with one of the cutting grooves.

Advantageously the cutting roller comprises a tubular supporting shaft and a casing tube which is provided with cutting grooves and is longitudinally displaceable in infinitely adjustable manner relatively to the stationary-mounted supporting shaft by means of an adjusting nut arranged within the side wall. When the cutting roller is driven by spur gearwheels, the cutting roller casing can also be displaced together with the supporting shaft in the bearings by means of an adjusting nut arranged outside the side wall.

In order that this invention may be more fully understood some embodiments in accordance therewith will now be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 shows the thirding of maximum-width paper webs in an apparatus for the longitudinal cutting of the webs,

Figure 2 is a view showing the quartering of maximum-width paper webs,

Figure 3 shows a partial longitudinal section through a cutting roller forming part of the apparatus and its displacement device,

Figure 4 shows in longitudinal section another constructional form of the cutting roller and the displacement device thereof, and

Figure 5 shows a side view of Figures 1 and 2.

According to the constructional example shown in Figure 1, the paper web, a plurality of such webs disposed in alignment one above the other, is/are to be cut from the maximum width A into three strips of identical width to one another B and brought together by means of a former 2. The dividing-off of the 1/3 width web 1′ is effected in an auxiliary cutting device 3 comprising a cutting knife and counter-knife, the part 1″ occupying 2/3 of the web width A being guided to the former 2 the centre of which is displaced transversely to the direction of travel, whereas

the part 1' which is 1/3 of the width is transferred by means of turning bars 9 upstream of the former 2 onto the left-hand half (in the illustration) of the 2/3 width web 1'' (see arrows). The halving of the 2/3 width web 1'' is effected by means of the cutting roller 4 co-operating with a cutting knife shortly before the former entrance, the cutting groove thereof to be used being set by longitudinal displacement of the roller with respect to the middle of the former 2. The centre line of the former 2 in the illustrated case is displaced to the extent "a" relatively to the machine centre line 5. The advantageous effect obtained by reducing the outlay involved is all the more apparent in the case of the subject of the present invention in proportion as more paper webs are to be cut one above the other (runs of paper) upstream of the former 2, since owing to the runs partly looping about the cutting roller 4 all the webs can be cut simultaneously by a counter-knife 10 co-operating with the cutting roller 4 without the danger of an oblique cut or running over one another or running apart from one another, which is the case with the auxiliary cutting device 3 with a straight paper through-flow for space reasons when there are several runs. Therefore in the latter cases each run must be provided with its own auxiliary cutting device.

In the constructional example shown in Figure 2 a paper web or webs 6 is/are to be cut for example from the same width A into four strips of the same width as one another, and the paper web is always guided centrally of the machine independently of its width. Halving the web 6 into two strips 6' and 6'' of equal width is effected by an auxiliary cutting device 8. Whilst one part 6'' of the paper web is supplied straight to the former 2, whose centre line in the illustrated constructional example is situated at a spacing "b" from the machine centre 5, the other part 6' is folded over the two turning bars 9 (adjusted to occupy a different position from that shown in Figure 1) upstream of the former 2 on to the part 6'', as indicated with arrows, and the two web halves 6', 6'' or a plurality thereof arranged one above the other are provided with a further cut line by the cutting device with the cutting roller 4 before the former entrance. In order to enable this last cut to be always carried out in the middle of the former, the cutting roller 4 is displaced laterally relatively to the constructional example shown in Figure 1, until one of the cutting grooves of the cutting roller 4 coincides with the centre line of the former 2; the position of the counter-knife 10 is then adjusted, separately, so that it can cooperate with the groove coinciding with the centre line of the former 2. Since furthermore strips of infinitely variable narrowness from a maximum value downwards are to be cut in the machine, the cut at the centre of the former cannot be executed simply by fitting additional cutting grooves beside the cutting grooves provided. Between the cutting edges of the cutting grooves it is not possible to go below a certain minimum spacing, since the cutting groove already has a clear width of about 6 mm. Thus from cutting edge to cutting edge there is a minimum spacing of about 25 mm, which therefore must be bridged by longitudinal displacement of the cutting roller 4.

Since the thirding and quartering of a paper web are the most frequent requirements in actual practice, only these are discussed in detail. But on the basis of these instructions it is also readily possible to sub-divide the paper webs in other ways by means of the longitudinally displaceable cutting roller 4 upstream of the former entrance and by means of the former 2 which is displaceable transversely to the paper web 1, 6 to an appropriate distance, and also a number of auxiliary cutting devices 3, 8 between printing units and cutting roller 4 in accordance with the number of paper webs situated one above the other. Instead of the single former illustrated, it is also possible to use two formers side by side or one above the other in the manner described. Their use is dependent in each case on the construction and extent of the product being printed and further description is not necessary, in view of the many possibiiities normally employed in practice.

Figures 3 and 4 show two constructional examples of the axial adjustment device for the cutting rollers 4 arranged upstream of the former entrance, which co-operate with swung-on counter-knives 10.

The cutting roller according to Figure 3 comprises substantially a supporting shaft 11 of circular cross-section and a casing tube 13 which is connected therewith by way of supporting rings 12 and receives the cutting rings 14 into which the counter-knives 10 engage. The supporting shaft 11 is mounted at both ends in bearing bushes 15 of the side walls 7, with the use of ball-bearings 16 which are secured in a housing 17 which is longitudinally displaceable in the bearing bush 15. With the housing 17 there is connected a screwthreaded element 18 in alignment with the supporting shaft 11, said element extending outside one side wall 7 and being engaged by an adjusting nut 19 which is supported so as to be axially non-displaceable in a two-part collar 20 of the bearing sleeve 15. Therefore, when the adjusting nut 19 is rotated, the supporting shaft 11 is displaced longitudinally with the casing tube 13 and therefore with the cutting ring 14 and, as mentioned initially, brought into register with the centre of the former. A lock nut 21 prevents loosening of the adjusting nut 19 during operation. The particular line of cut desired can be adjusted on a

scale 22 on the screw-threaded element 18. The adjusting device described, wherein supporting shaft and casing tube can be axially adjusted jointly, can only be used for a spur-gearwheel drive for the cutting roller 4.

Figure 4 on the other hand shows a construction of the cutting roller and its adjusting device in a case where drive is provided, as is generally conventional, by means of bevel gearwheels, which are not capable of accepting axial thrust. Thus the shaft of the cutting roller must not accept the axial thrust and must be mounted in axially rigid manner.

In this case the cutting roller consists of a tubular supporting shaft 23 which is mounted to be laterally non-displaceable in the side walls 7. Arranged in longitudinally displaceable manner about the supporting shaft 23 is a casing tube 24 on which there are interchangeably arranged the cutting rings 25 which are each provided with one, two or more grooves. One bearing journal 26 of the supporting shaft 23 is provided with a screwthread 27 in which an adjusting nut 28 engages whose cylindrical prolongation is connected to the casing tube 24 by way of a two-part ring 29. By turning the adjusting nut 28 the casing tube 24 is moved longitudinally with the two-part cutting rings 25 and can be infinitely adjusted to the particular line of cut required. A lock nut 30 prevents loosening of the adjusting nut and must be loosened first of all for lateral adjustment. The transmission of torque from the journal to the casing tube 24 is effected through the agency of a key interposed at the opposite casing tube end between the bearing journal and an end disc connected securely to the casing tube. The particular advantage of the last-mentioned adjusting device is that the adjusting nut is arranged within the side wall 7 and therefore when the full working width of the printing units is used requires no additional space outside. The adjusting travel of the adjusting nut 28 is conveniently so chosen that it is greater than the spacing of two neighbouring grooves of a cutting ring 25. In this way there is obtained great variability in cutting widths with a relatively slight displacement of the casing tube in conjunction with multi-groove cutting rings 25.

The apparatus described cuts paper webs longitudinally into strips of the same width as one another in such a manner that the outlay involved is considerably reduced as compared with known apparatus and a change-over to other paper web widths and cut widths can be carried out quickly and in an infinitely variable manner. The paper web is also guided centrally between the side walls of the apparatus even with varying widths owing to the printing plate production and the laterally precise fixing of the plates on the plate cylinder.

The embodiments described make it possible when dividing several webs into three for the 2/3 width runs to be cut jointly one over the other on the cutting roller before the former entrance, so that auxiliary cutting devices are required only for the 1/3 width runs. When sub-dividing several webs into four equal strips, again, it is simply necessary to provide auxiliary cutting devices for halving the or each web width, whereas the half-width webs are brought together upstream of the former and can be cut together to a quarter width by the cutting roller before the former entrance. As a result there is a substantial reduction in the number of component parts, so that the arrangement is also considerably improved.

WHAT WE CLAIM IS:—

1. An apparatus for the longitudinal cutting of a printing paper web, or a plurality of such webs disposed in alignment one above the other, into strips of the same width, said apparatus including, for the or each web, an auxiliary cutting device for cutting the particular web into two strips, turning bars for bringing one of the two strips on to the other of the two strips, in the or each case, for another cutting operation in which one or both of the strips are cut in such manner that the strips become or remain of the same width, and the apparatus further including a device for effecting said another cutting operation and at least one former for bringing the strips of the same width together to present them to a folding apparatus of a rotary printing machine, said former being displaceable transversely to the direction of web movement to accommodate different strip width and the device for effecting said another cutting operation being disposed upstream of the former and comprising a cutting roller defining a plurality of peripheral cutting grooves, and a counter-knife, the cutting roller being disposed with its axis at right angles to the direction of web movement and being axially displaceable independently of the former, the counter-knife also being mounted displaceably whereby it can be set to cooperate with one of the cutting grooves.

2. An apparatus as claimed in claim 1, wherein the cutting roller consists of a tubular supporting shaft and a tubular casing which defines the cutting grooves and which is axially displaceable on the supporting shaft.

3. An apparatus as claimed in claim 2, wherein the supporting shaft is journalled in bearings in two stationary side walls of the apparatus and one bearing journal is provided with a screwthread which cooperates with an adjustable nut for axially displacing the casing, which nut is located between the side walls and defines an annular groove which engages with a ring rigidly secured to the tubular casing.

4. An apparatus as claimed in claim 3,

wherein a lock nut is provided for locking the adjustable nut.

5. An apparatus as claimed in claim 1, wherein the cutting roller comprises a supporting shaft of circular cross-section and a tubular casing which is rigidly secured to the shaft and which defines the cutting groove, the shaft and the casing being jointly displaceable axially between stationary side walls of the apparatus.

6. An apparatus as claimed in claim 5, wherein the supporting shaft is journalled in respective bearings in the apparatus side walls, the bearing cage of one of the bearings being rigidly secured to an element which is in alignment with the shaft and which is provided with a screwthread cooperating with an adjustable nut which is operative to move the element so as to axially displace the roller.

7. An apparatus as claimed in claim 6, wherein the said element is additionally provided with a scale for determining the line of cut and a lock nut is provided for locking the adjustable nut.

8. An apparatus as claimed in claim 6 or 7, wherein a collar for supporting the adjustable nut is secured to the side wall which is nearer the said bearing cage.

9. An apparatus for the longitudinal cutting of a printed paper web, or a plurality of such webs disposed in alignment one above the other, into strips of the same width, substantially as hereinbefore described with reference to Figures 2, 3 and 5 or to Figures 1, 4 and 5 of the accompanying drawings.

HASELTINE, LAKE & CO.,
Chartered Patent Agents,
28, Southampton Buildings,
Chancery Lane,
London, WC2A 1AT.
Agents for the Applicants.

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1354924 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*